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MILKING MANAGEMENT PRACTICES BY SMALL-SCALE DAIRY FARMERS OF TRASHIYANGTSE DISTRICT IN BHUTAN

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ABSTRACT: This study was conducted to draw baseline information on milking management practices adopted by small-scale dairy farmers of Yangtse and Boomdeling gewogs under Trashiyangtse dzongkhag, Bhutan. The study sites and respondents were selected using multi-stage random sampling, whereas data were gathered using pre-tested structured questionnaires through face-to-face interviews with dairy farmers and field observations in December 2019. The data gathered from 131 dairy farmers were cleaned and analyzed using descriptive statistics. The results show that person milking animals are mostly female and illiterate. Dairy farmers predominantly rear jersey cross and native cattle. Most farmers manually milk using hands, milk letdown by allowing calves to suck before milking, practice straining of milk, and breed cattle by bulls. However, the majority of farmers use stripping or knuckling milking methods, follow irregular milking intervals, milking in the byre, do not practice teat dip, do not test for mastitis, maintain wide calving intervals, and keep drying periods longer than two months. The findings from the study show a lack of scientific knowledge and skills in milking practices. Accordingly, this study recommends concern stakeholders to educate dairy farmers of rural Bhutan on scientific milking management practices.

Keywords: Milk management; milking practices; small-scale dairy farmers; stripping.

1. INTRODUCTION

People engaged in self-employment, particularly those working on their land, predominate Bhutan's economy (National Statistics Bureau [NSB] 2019). For instance, 53.7% of overall employment and 74% of rural employment is in the agriculture sector (NSB 2018a). Livestock plays a vital role in the self-subsistence integrated farming system of Bhutan to meet households' nutrition, draft power, income, and manure. Among others, cattle are widely reared animals in many parts of Bhutan. According to the Department of Livestock (2018), the cattle population in Bhutan as of 2018 was 317,451. Traditionally, dairying involved the rearing of native cattle (e.g., Siri breed). Despite low productivity, native cattle are resistant to diseases and easy to manage compared to improve animals (Tamang et al. 2019). However, with the commencement of dairy development programs in the country in the 1960s, the Royal Government of Bhutan has been investing in extension services to increase animal production and improve animal management. Extension services include breeding programs (supply of breeding bulls and artificial insemination), animal disease management, fodder management, animal production, and product value addition. Additionally, the government has been supporting dairy farmers to buy high-yielding animals and the construction of sheds on a cost-sharing basis (Thapa et al. 2019).

Today, dairy farmers are gradually transforming from self-subsistence to semi-commercial and commercial farming by adopting improved cattle and better management practices. According to NSB (2019), the population of improved cattle increased from 99,544 in 2016 to 112,648 in 2018, whereas the population of native cattle in Bhutan dropped to 185,953 in 2018 from 203,194 in 2016. It is essential to ensure clean dairy products for self-consumption and customers during such a transformation of dairying. However, Asian dairy farmers are less aware of the economic aspect of scientific milk production because they are smallholders, illiterate, and follow traditional dairying (Aulukh and Singh 2015). Similarly, there is a limited understanding

of milking management practices followed by Bhutanese dairy farmers in general. In an attempt to address this research gap, this study aims to draw baseline information on milk management practices adopted by smallholder dairy farmers in the Trashiyangtse district in eastern Bhutan.

2. MATERIAL AND METHODS

2.1 Study site selection and sampling

The study was carried out in two gewogs (sub-districts), namely Boomdeling and Yangtse gewogs under the Trashiyangtse district (Figure 1). The study sites and respondents were selected, employing a multi-stage random sampling method. First, researchers randomly selected Boomdeling and Yangtse gewogs using the lottery (with replacement) method out of eight gewogs in the district. In the second phase, researchers randomly selected 135 farmers.

Figure 1: Map showing Boomdeling and Yangtse gewogs

2.2 Data collection and analysis

The data were collected in December 2019 by personal interviews using structured questionnaires (pre-tested with five dairy farmers not included in the analysis). The structured questionnaire used in this study was partially adopted from several other studies (Thapa et al. 2019; Bafanda et al. 2018; Bashir and Kumar 2013; Gupta et al. 2008). Some questions were added or deleted to capture information in Bhutan's context. Besides, researchers also observed the milking cows and their environments physically to validate their responses. However, this study excluded four respondents from the analysis due to their incomplete responses. Therefore, responses provided by 131 dairy farmers of the selected gewogs yielded the current results. The data gathered were analyzed using descriptive statistics, including mean, frequencies, and percentages in the Statistical Package for Social Science (SPSS) version 19.0.

3. RESULTS AND DISCUSSIONS

3.1 Profile of person milking

Table 1 presents the age, gender, and qualification of persons involved in milking. Understanding the profile of people who milk the animals is of paramount importance to design programs to improve general milking management practices. The average age recorded for person milking was 43.3 years, with a standard deviation of 13.2, indicating the engagement of middle-aged family members in milking. The study results also reveal that in rural Bhutan, more women (80.9%) were engaged in milking than men (19.1%). This finding is true, as agriculture farming in general employed more women (63.2%) than men (46.2%) in Bhutan (NSB 2018a). Kumar et al. (2017) also reported the engagement of more women than men in milking in India. The study recorded that about 66.4% of family members involved in milking animals are illiterate. These results imply that stakeholders design programs related to milking management practices to suit illiterate farmers with a particular focus on women.

Table 1: Characteristics of persons milking animals

Characteristics	Categories	Sample (n = 131)	
		Frequency	Percent
Age	Mean = 43.3		
Gender	Male	25	19.1
	Female	106	80.9
Qualification	None	87	66.4
	Non-Formal Education	25	19.1
	Primary School	09	06.9
	Secondary School	05	03.8
	High School	05	03.8
	Graduate	00	00.0

3.2 Cattle composition among dairy farmers

Dairy farmers in Trashiyangtse rear pure jersey, jersey cross, and native cattle. Most dairy farmers (46.37%) were rearing jersey cross cattle (Table 2). A plausible reason is that purchasing pure jersey is expensive for many dairy farmers; thus, they crossbreed jersey with

native cattle. Thapa et al. (2019) also reported the crossbreeding of improved cattle with native cattle as a common practice in Bhutan. The total number of native cattle was also large at 42.15%. The prevalence of low-yielding cattle, such as native and jersey cross, indicates that dairying for many farmers is a small-scale venture meant for self-consumption. Less quantity of milk due to the fewer high-yielding cattle (Tamang et al. 2019) could be a potential reason for not having a milk-processing unit in these two gewogs in 2018 (NSB 2018b). However, farmers also rear native bulls (8.55%) and jersey cross bulls (6.67%) as draft animals because of their known resistance against geo-climatic conditions of the region (Tamang et al. 2019).

The study recorded 84.7% of the total respondents adopting calf to suck teats before milking as the most common practice to initiate milk letdown. Similar other studies have also supported the practice of milk letdown with the help of calves as a widespread practice (Thapa et al. 2019; Bafanda et al. 2018; Kumar et al. 2017; Sabapara et al. 2015; Gupta et al. 2008). However, when the calf is dead, concentrate feeding is popular (54.2%), followed by letting dams lick the hide of the dead calf (22.9%), and the use of warm water (19.8%). The majority of farmers in the Surat District of India also reported using concentrate feeding during the death of the calf (Sabapara et al. 2015). Only 3.1% of dairy farmers have access to oxytocin, and the majority of respondents are neither aware of its availability nor its uses.

Table 2: Average cattle composition of dairy farmers

Cattle Type	Calf		Milch	Dry	Heifer	Bull	Total
	Male	Female					
Jersey	10 (1.17)	19 (2.22)	29 (3.40)	11 (1.29)	15 (1.76)	14 (1.64)	**98 (11.48)**
Jersey cross	37 (4.33)	70 (8.20)	93 (10.89)	66 (7.73)	73 (8.55)	57 (6.67)	**396 (46.37)**
Native	30 (3.51)	48 (5.62)	66 (7.73)	90 (10.54)	53 (6.21)	73 (8.55)	**360 (42.15)**
Total	77 (9.02)	137 (16.04)	188 (22.01)	167 (19.56)	141 (16.51)	144 (16.86)	**854 (100)**

3.3 Milking management practices

Table 3 presents the milking management practices adopted by smallholder dairy farmers. The study recorded that all dairy farmers milk animals manually with their hands. In agreement with this result, several published papers in India have also reported that the majority of dairy farmers practiced hand-milking (Bafanda et al. 2018; Kumar et al. 2017; Bashir and Kumar 2013).

In the study area, farmers practice small-scale dairying with few numbers of milking cows; thus, they do not require sophisticated machines for milking, unlike commercial dairy farmers. More than half of the dairy farmers (50.4%) used the stripping milking method, followed by a few farmers (9.2%) practicing the knuckling milking method. Several other studies conducted in India have also reported that the majority of smallholder dairy farmers practice either knuckling or stripping milking methods (Kumar et al. 2017; Sabapara et al. 2016; Sabapara et al. 2015; Kumar et al. 2014; Rathore et al. 2010). Scientifically, these two methods are unhealthy practices because they can injure teats and cause mastitis (Bafanda et al. 2018). Thus, extension officials should educate and encourage rural farmers to use the full hand milking method like farmers of some regions in India (Bashir and Kumar 2013; Kumar and Mehla 2011). The results suggest that some dairy farmers are less aware of proper milking methods even today. The study recorded about 50% of dairy farmers milking cows with wet hands, which upsets the health of udder (Sabapara et al. 2016, 2015).

It was observed that 91.6% of respondents milked the animals once a day, which might be attributed to being smallholders' dairy farmers, rearing a few numbers of native cattle or jersey, and also calves are released along with dams for grazing during the daytime. This finding disagrees with the results of studies from India (Kumar et al. 2014; Bashir and Kumar 2013; Gupta et al. 2008), who have reported milking the animals twice a day. The remaining farmers (8.4%) who reared pure jersey and adopted stall feeding reported milking their animals twice a day. More than half of the dairy farmers (55.7%) had an irregular milking interval showing the need to create awareness on the merits of milking at regular intervals. On average, dairy farmers took slightly over eight minutes to complete milking a cow. Scientifically, milking should complete within a short time, as the oxytocin effect lasts only about five to seven minutes (Bafanda et al. 2018). Thus, there is a need for concerned stakeholders to educate dairy farmers on the benefits of completing milking in the shortest time possible.

The majority of dairy farmers (80.2%) tethered milking animals in the byre. A conceivable reason could be that many cowsheds have concrete floorings and zinc roofing, which is much cleaner than the traditional sheds. However, dairy farmers should be encouraged to milk outside the cowsheds (preferably dry and hygienic places) to improve milk cleanliness. Similarly, dairy farmers in India were also found milking animals in the byre (Kumar et al. 2014; Bashir and Kumar 2013; Rathore et al. 2010;

Gupta et al. 2008). The majority of dairy farmers (95.4%) in the study areas strain milk before milking using a clean piece of cloth or a sieve. This result was encouraging in contrast to the result reported by Bafanda et al. (2018), where farmers in the Jammu district of India do not strain milk.

Maintaining a healthy udder is necessary for milking cows. Thus, dairy farmers should regularly practice teat dip after milking and test for mastitis to reduce udder infection. However, the result observed that the majority of farmers (90.1%) did not practice teat dip or test for mastitis (61.1%). Several studies in neighboring India have also reported that dairy farmers do not practice teat dips and do not test for mastitis (Bafanda et al. 2018; Bakat et al. 2017; Sabapara et al. 2016; Sabapara et al. 2015; Bashir and Kumar 2013). These two results suggest that dairy farmers in rural Bhutan are less aware of the advantages of teat dipping and mastitis testing. As teat dipping and testing for mastitis will improve udder health by reducing infections in the long run, concerned stakeholders should design training programs to enhance farmers' knowledge and skills to practice teat dip and test mastitis.

It is essential for dairy farmers to dry-off milking cows roughly two months before the beginning of the next lactation (Bafanda et al. 2018; Sabapara et al. 2016). However, the study recorded longer drying periods with a mean of 4.47 months and a standard deviation of 3.48. This finding disagrees with that of Sabapara et al. (2016), who reported that farmers dry-off dairy animals for less than two months. Plausible reasons reported are failure to detect heat on time and failure to meet the nutritional

Table 2: Milking methods practiced by dairy farmers

Milk management practices	Categories	Sample (n=131)	
		Frequency	Percent
Milking mode	Hand milking	131	100.0
	Machine milking	0	00.0
Hand milking style	Full Hand	13	09.9
	Knuckling	12	09.2
	Stripping	106	80.9
Habit of milking	Dry hand	66	50.4
	Wet hand	65	49.6
Milk let down (calf alive)	Sucking by calf	111	84.7
	Concentrate feeding	9	6.9
	Combination of above two	11	8.4
Milk let down (calf dead)	Concentrate feeding	71	54.2
	Use of oxytocin	4	3.1
	Letting dam lick the hide of a dead calf	30	22.9
	Use of warm water	26	19.8
Daily milking times	Once	120	91.6
	Twice	11	8.4
Milking interval	Regular	58	44.3
	Irregular	73	55.7
Milking completion time (minutes)	Mean = 8.30		
Milking place	Tethering in the byre	105	80.2
	Outside of the byre	26	19.8
Straining of milk	Yes	125	95.4
	No	06	04.6
Teat dip practices	Practice teat dip	13	9.9
	Do not practice teat dip	118	90.1
Mastitis control	Test for mastitis	51	38.9
	Do not test for mastitis	80	61.1
Drying off cow	Self-drying	107	81.7
	Complete cessation of milking	19	14.5
	Incomplete milking	04	03.1
	Intermittent milking	01	00.8
Drying period (months)	Mean = 4.47		
Breeding method	Natural insemination	119	90.8
	Artificial insemination	12	9.2
Calving interval	Mean = 1.44		

requirements of cows. Farmers are not able to meet the nutritional requirements of animals because commercial concentrate feeds are expensive and not affordable by many small dairy farmers owing to high transportation costs. The Department of Livestock and relevant authorities should explore alternative solutions to increase access to commercial concentrate feeds at reasonable prices.

Despite several techniques of drying milking cows, self-drying and complete cessation of milking are widely practiced by dairy farmers with 81.7% and 14.5%, respectively. Kumar et al. (2017) and Kumar et al. (2014) also reported cases where the majority of farmers practiced self-drying. All farmers practice the drying of cows. However, maintaining an extended drying period and the practice of self-drying indicates that farmers are not able to meet the nutritional requirements of cows. Thus, stakeholders must create awareness of the importance of feeding a nutritive diet, so that cows can give milk for about ten months, followed by two months of drying-off periods.

More than 90% of dairy farmers breed cattle by breeding bulls supplied by the government or those owned by private individuals in the community. A recent study by Thapa et al. (2019) conveyed that members of dairy farmer groups are more likely to adopt artificial insemination (AI) compared to non-members. The prevalence of exceptionally few such groups in the study area could also be a reason for not opting AI. However, improving access to resources of the AI could accelerate its usage soon. In agreement with the current findings, Rathore et al. (2010) and Gupta et al. (2008) also reported that the majority of farmers were relying on natural services for breeding their cattle. The average time taken by a cow to give a calf is 1.44 years, with a standard deviation of 0.67, possibly due to poor heat detection and undernutrition.

4.CONCLUSIONS & RECOMMENDATIONS

The current study suggests that dairy farmers in rural Bhutan still lack knowledge and skills in scientific milking management practices. For instance, many farmers use the stripping and knuckling style of hand milking, which could cause teat and udder infection. Additionally, farmers neither practice teat dipping nor test for mastitis. Furthermore, results found unhealthy practices, including milk at irregular intervals, milk in the unhygienic byre, take more than 7 minutes to complete milking, prolong calving interval, and maintain an extended drying period (more than two months). Given these findings, the Department of Livestock, along with other stakeholders, needs to provide hands-on training programs on good milking management practices to dairy farmers in rural Bhutan. Training packages containing demonstrations, field visits to integrated dairy farms, and awareness sessions could provide adequate exposure to good milking management practices. Since the majority of people milking in remote areas are women and illiterate, the training design and other interventions should focus on this section.

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REFERENCES

Aulakh GS and Singh R (2015). Socio-economic characteristics of farmers and status of buffalo health care practices. The Indian Journal of Animal Sciences, 85(12): 1396-1398.

Bafanda RA, Nanda R, Minhaj SU, Choudhary F and Thapa L (2018). Analysis of milking management practices followed by dairy farmers of RS Pura Block in Jammu District. Advances in Research, 15(6): 1-7.

Bashir BP and Kumar VG (2013). Milking management practices followed in selected areas of the Kottayam District of Kerala State. Journal of Life Sciences, 5(1): 53-55.

Bhakat C, Chatterjee A, Mandal DK, Karunakaran M, Mandal A, Garai S and Dutta TK (2017). Milking management practices and IMI in Jersey crossbred cows in changing scenario. Indian Journal of Animal Sciences, 87(4): 95-100.

Department of Livestock (2018). Livestock Statistics 2018. Department of Livestock, Thimphu Bhutan.

Gupta DC, Suresh A and Mann JS (2008). Management practices and productivity status of cattle and buffaloes in Rajasthan. Indian Journal of Animal Sciences, 78(7): 769-774.

Kumar M and Mehla RK (2011). Milking management practices of buffaloes in the rural areas of Punjab. Indian Journal of Animal Production and Management, 27(1/2): 23-25.

Kumar S, Jain A and Gupta AK (2014). Studies on breeding, health care and milking management practices adopted by the dairy owners in Shahdol district of MP, India. International Research Journal of Biological Sciences, 3(10): 32-36.

Kumar S, Subash S and Jangir R (2017). Feeding and milking management practices adopted by indigenous cattle farmers in Thar Desert of Rajasthan. Journal of Animal Health and Production, 5(1): 14-18.

NSB (2018a). Labour Force Survey Report, Bhutan. Royal Government of Bhutan, Thimphu Bhutan.

NSB (2018b). Trashiyangtse Dzongkhag at a Glance, 2018. Royal Government of Bhutan, Thimphu Bhutan.

NSB (2019). Statistical Yearbook of Bhutan 2019. Royal Government of Bhutan, Thimphu Bhutan.

Rathore RS, Singh R, Kachwaha RN and Kumar R (2010). Existing management practices followed by the cattle keepers in Churu district of Rajasthan. Indian Journal of Animal Sciences, 80(8): 798-805.

Sabapara GP, Desai PM and Kharadi VB (2016). Milking management practices of dairy animals in tribal area of South Gujarat, India. Livestock Research International, 4(1): 55-58.

Sabapara GP, Fulsoundar AB and Kharadi VB (2015). Milking and health care management practices followed by dairy animal owners in rural areas of Surat district. Scholars Journal of Agriculture and Veterinary Sciences, 2(2A): 112-117.

Tamang NB, Rai DB, Dendup T, Koirala AN and Tshering S (2019). Effect of parity on milk yield and calving interval of thrabam cattle at Nucleus Herd, Tashiyangphu, Bhutan. Bhutan Journal of Animal Science. 3 (1): 22-26.

Thapa L, Choden D and Tamang NB (2019). Adoption of improved dairy production practices by dairy and non-dairy farmers' groups. Bhutan Journal of Animal Science, 3(1): 14-21.